

High Plains Aquifer and the U.S. Geological Survey National Water-Quality Assessment Program

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The U.S. Geological Survey (USGS) National Water-Quality Assessment (NAWQA) Program was implemented in 1991 with long-term goals to describe the status and trends in the quality of the Nation's surface- and ground-water resources and to determine the natural and human factors affecting water quality. A NAWQA ground-water study of the High Plains regional aquifer was initiated in 1998 to assess the occurrence and distribution of water quality. The High Plain regional aquifer consists of unconfined and unconsolidated sand and gravel that may be vulnerable to effects from land-surface activities. Residential and urban settings, agricultural practices, and oil- and gas-exploration/development are potential sources of contamination to this aquifer.

In 1999, the USGS collected water samples from 46 randomly selected domestic water-supply wells located throughout the High Plains aquifer in Kansas using rigorous sampling protocols. The purpose of this survey was to define the broad-scale water-quality conditions in the High Plains aquifer. Samples were analyzed for major ions, nutrients, trace elements, pesticides, volatile organic compounds (VOCs), dissolved organic carbon, and radon. A detailed description of land-use characteristics within a 500-meter radius of each well also was acquired.

Water from 22 percent of the wells sampled in Kansas had dissolved solids concentrations greater than the U.S. Environmental Protection Agency (USEPA) Secondary Maximum Contaminant Level of 500 milligrams per liter for drinking water; dissolved solids in water from 2 of the 46 wells exceeded 1,000 milligrams per liter. Water from 9 percent of the wells had nitrate concentrations greater than the 10-milligrams-per-liter USEPA Maximum Contaminant Level (a primary drinking-water standard); 76 percent of the wells had nitrate concentrations greater than 2.0 milligrams per liter, which indicates potential enrichment from land-use activities. Concentrations of trace elements exceeded water-quality standards in water from only two wells. Concentrations of arsenic and manganese exceeded standards in one sample each from these two wells. Atrazine and its metabolite deethylatrazine were the most frequently detected pesticides in samples from 41 percent and 46 percent of the wells, respectively. Infrequently detected pesticides included metolachlor (five detections), carbofuran (one detection), diazinon (one detection), malathion (one detection), and simazine (one detection). No pesticide concentration exceeded drinking-water standards. Volatile organic compounds were rarely detected in water from the 46 Kansas wells. When VOCs were detected, concentrations were substantially less than drinking-water standards. In samples from the 46 wells, concentrations of dissolved organic carbon ranged from 0.2 to 1.5 milligrams per liter (no drinking-water standard), and radon concentrations ranged from 195 to 1,580 picocuries per liter (no drinking-water standard).

Planned NAWQA activities in Kansas for 2000 include an evaluation of land-use effects on ground-water resources. The objective of the land-use evaluation is to determine the occurrence and distribution of water-quality constituents in recently recharged ground water associated with the regionally significant environmental settings of land-use and hydrologic conditions. Results of tritium analysis suggest that the amount of time it takes recharge to travel from land surface to the water table is less than 50 years in many places in western Kansas. The effects of irrigated agriculture on ground-water quality in the High Plains aquifer will be examined in western Kansas. The effects of recently developed (past 20-30 years) residential and commercial areas on shallow ground-water quality will be examined near the city of Wichita.